

SCUBA TANK LOCK

Field of the Invention:

The invention relates to locking devices and more particularly to a locking device for use with diving equipment.

Background of the Invention:

Recreational and professional scuba divers require numerous accessories for underwater exploring and/or work. The accessories include air tanks, weights, buoyancy compensators, computers, wet suits, float balls/flags, and so forth. All such accessories are necessary for a safe dive and typically consist of the latest in technology. Thus, even if older equipment is used it is meticulously maintained since any failure could result in injury or death. For this reason, most any accessory used in diving is very expensive and, due to the portability of the profession, easily transported.

While many of the accessories can be hidden from the view of a potential thief, some of the accessories are impractical to conceal due to size, weight, space considerations or the inherent dangers associated with concealing some of the items. For instance, scuba tanks are commonly left on the deck of a boat due to problems in storage. Since scuba tanks are expensive and easily moved they make for easy prey by thieves.

Scuba tanks may be left on a deck of a boat due to lack of storage space but more commonly are left on the deck due to dangers associated with attempting to conceal scuba tanks. Scuba tanks are very heavy, weighing approximately 40 pounds when fully charged and contain 3000 pounds per square inch of compressed air. At the upper end of a scuba tank there is a K-valve that should it be broken off, the compressed air would project the K-valve flying at a

1 velocity sufficient to cause death or serious injury to a person struck by it. Consequently, tanks
2 are typically stored in the vertical position in the cockpit of a boat in a holder commonly
3 referred to as a tank rack.

4 The amount of compressed air utilized by a scuba diver in the course of his underwater
5 activities depends on the depth at which he is diving; greater amounts of air are utilized at
6 greater depths. However, on the average, a diver will utilize a full tank of air in 30-40 minutes.
7 For this reason, a diver will typically employ at least two tanks for any diving expedition. Since
8 it is most unsafe to dive alone, a diver typically travels with at least one other diver which
9 results in at least four scuba tanks that could be stolen if unattended.

10 There are various known tank racks that are designed to secure a particular size tank and
11 may include provisions for locking of the scuba tanks. The following patents provide examples
12 of scuba tank racks: U.S. Pat. No. 3,791,403; 2,122,897; 3,193,778; 3,860,048; 3,693,830; and
13 1,174,185.

14 In addition, cable locking devices are known in the art. For instance, Stone, U.S. Patent
15 No. 3,841,118 discloses a cable lock designed to facilitate locking motorcycles, bicycles,
16 snowmobiles and outboard motors to a post or tree to prevent theft. The cable lock includes an
17 elongated cable and a pair of mating block sections with means for securely locking the same
18 around the cable to form a positively locked loop.

19 McCrea, U.S. Patent No. 6,003,348, discloses a cable lock for surfboards. A sleeve
20 fitting is swaged to a length of cable such that a loop is formed at the end of cable. This loop
21 is used to secure the cable to a rack or other stationary component. A block is used to retain the
22 cable around the object itself. The cable passes through a hole in one end of the block, wraps

1 around the object, and slides into a slot in the other end of the block. An end fitting swaged to
2 the cable prevents the cable from sliding out of the slot in a parallel direction. A padlock is used
3 to prevent the cable from sliding out of the slot in a perpendicular direction. A setscrew is used
4 to retain the block to the cable in the desired location.

5 Lyon et al, U.S. Patent No. 3,987,653, disclose a locking device for a looped cable
6 which includes a casing in which one end of the cable is anchored and a passageway through
7 the casing through which the other end of the cable can be passed. Within the casing is a cable
8 clamp for reducing the size of the passageway, the clamp being threaded on a screw and
9 movable to change the size of the passageway by rotation of the screw. The screw is rotatable
10 by rotation of a lock mounted in the casing, the lock being rotatable by a key. The clamp
11 cooperates with a bed to define the passageway, the clamp and bed having intercalated
12 pyramidal teeth which can exert a vise-like grip on a cable of normally cylindrical shape.

13 Gerow, U.S. Patent No. 6,212,919, discloses an adjustable cable loop locking system
14 for securing two spaced apart articles, such as a boat to dock piling, with a length of flexible
15 cable. The system includes first and second mechanisms slidably disposed on opposite end
16 portions of a cable in which are formed first and second cable loops respectively. A flexible
17 sheath, which may be a conventional hollow hydraulic hose, slidably covers a central portion
18 of cable and is affixed on opposite ends thereof to the first and second mechanisms to fix the
19 distance between the mechanism as measured along the central portion of the cable. The two
20 lead-in portions of the first loop slidably extend through the first mechanism except that one of
21 these lead-in portions which contains a free end of the cable can be selectively locked in a
22 stationary position in the first mechanism by operation of a locking handle when desired. One

1 of the lead-in portions of the second loop which extends from the first mechanism extends
2 slidably through the second mechanism to the second loop, the end of the cable at the end of the
3 second loop being fastened in the second mechanism. The arrangement permits securing two
4 spaced apart articles together while needing to lock only the first of the two mechanisms.

5 Zakow, U.S. Patent No. 4,212,175, discloses a lock for items of portable personal
6 property. The lock includes a plurality of cables extending from a locking box which is
7 mountable to a mounting surface. The items of personal property are mounted to the cables, and
8 at least one end of each cable is secured to one of a plurality of nipples disposed within the box.
9 The locking box has an inner box member and an outer box member which are matable to form
10 the box; the width of the opposed side walls of both the inner box member and the outer box
11 member are generally equal, so that jimmying, or forced opening of the box is precluded since
12 the free edges of the side walls of the outer box member are contiguous with the fixed planar
13 surface when the assembled box is mounted to the surface.

14 Best, U.S. Patent No. 4,055,973, discloses an equipment lock for laboratory or office
15 equipment and the like. To prevent removal of the items, separate cables are attached to four
16 or more items of such equipment and have circumferentially-grooved end members which are
17 received in separate bores in a single lock body and are locked therein by a key-controlled
18 keeper. The keeper is a key-removable core inserted in a core chamber which partially
19 intersects the cable-receiving bores, so that the core itself engages in the grooves of the cable
20 end members to lock them against retraction. A mounting screw access passage traverses the
21 core chamber, and is blocked by the core in such chamber to prevent access to a mounting screw
22 inserted through such passage.

1 Leyden, U.S. Patent No. 5,154,072, discloses a cable lock for securing a plurality of
2 cables having a blocking shoulders on the ends. The cable lock has openings dimensioned to
3 receive the cable shoulders. A cover is mounted for selective movement relative to the housing
4 between a position permitting passage of the cable through the opening to a position preventing
5 passage of the cable through the opening. The housing is secured with a key operated tumbler
6 lock.

7 Keifer, U.S. Patent No. 4,598,827, discloses a system for securing display items to a
8 fixture or the like comprising a housing adapted to be secured to the fixture and a plurality of
9 elongated cables for securing the display items to the fixture. Each cable has a means at one
10 end for securing it to the display item and is detachably secured in the housing at its opposite
11 end. The housing includes cable retention and release channels for a plurality of cables. The
12 channels have an enlarged entrance portion and are configured to permit insertion and removal
13 of the opposite ends of the cables so that any one of the cables may be inserted or removed
14 individually. The housing includes a locking means blocking the entrance portion of the
15 channels and a second position permitting removal of the cables.

16 However, what is lacking in the art is the ability to securely lock single, or a plurality,
17 of scuba tanks to most any tank rack or fixed object as well as secure various accessories.

1 SUMMARY OF THE INVENTION

2 Briefly described, and in accordance with one embodiment thereof, the invention
3 provides a scuba tank locking device formed from a lock plate having an aperture with a slot
4 extending therefrom. A flexible cable having a distal end is permanently attached to the lock
5 plate with a distal end available for wrapping around the component to be locked. The flexible
6 cable includes a line crimp that engages the slot. The aperture is then available for receipt of
7 a larger cable lock that secures the lock plate, and the attached accessory, to a fixed object.

8 It is an objective of the invention to provide an inexpensive, durable, reliable, and
9 portable means of locking scuba tanks.

10 It is another objective of the invention to provide a locking device which can
11 conveniently lock scuba tank accessories such as weights, regulators, gauge units, buoyancy
12 compensators, and the like accessories.

13 It is another objective of the invention to provide a locking device wherein scuba tanks
14 can be securely locked without the necessity of making precise tank positioning adjustments.

15 Still another objective of the invention is to provide a scuba lock system that can quickly
16 and safely secure scuba tanks and gear, either on the dock, in a vehicle, or anywhere that
17 opportunistic theft is a possibility.

18 Another objective of the invention is to provide a locking device that can lock scuba
19 tanks of various heights and diameters.

20 Other objectives and advantages of this invention will become apparent from the
21 following description taken in conjunction with the accompanying drawings wherein are set
22 forth, by way of illustration and example, certain embodiments of this invention. The drawings

1 constitute a part of this specification and include exemplary embodiments of the present
2 invention and illustrate various objects and features thereof.

3 4 DRAWINGS

5 Figure 1 is a pictorial view of four scuba tanks having the locking device of the instant
6 invention secured to each tank and further secured to a fixed structure;

7 Figure 2 is a perspective view of an embodiment of the scuba tank locking device
8 without a handle;

9 Figure 3 is a front perspective view of an embodiment of the scuba tank locking device
10 with a handle;

11 Figure 4 is a rear perspective view of Figure 3 an embodiment of the scuba tank locking
12 device with a handle; and

13 Figure 5 is a side view of the locking device with handle secured to a scuba tank.
14
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DETAILED DESCRIPTION

Although the invention will be described in terms of a specific embodiment, it will be readily apparent to those skilled in this art that various modifications, rearrangements and substitutions can be made without departing from the spirit of the invention. The scope of the invention is defined by the claims appended hereto.

Now referring to Figure 1, depicted are multiple scuba tanks 1-4 each having a locking device 10 placed in position for securing the tanks to a fixed structure 100. The locking device is formed from a steel lock plate 12 having a flexible attachment cable 18. One end 20 of the cable 18 is preferably permanently attached to the steel plate 12 and a distal end 22 having an end fitting 24 swaged thereto. The end fitting 24 may be sized for insertion through an aperture 14 in the steel plate 12 or permanently inserted therethrough with the end fitting enlarged to operate as a pull handle 24'. Multiple cable crimps 25 are used to provide locking of the flexible cable 18 at predetermined positions. When at least two cable crimps 25 are used, the cable 18 will be fixed to prevent lengthening as well as shortening of the cable. This is important when securing diving accessories where movement of the flexible 18 may otherwise provide a thief with the ability to dislodge an accessory. The steel lock plate 12 and flexible cable engage a K-valve 30 and further couple to a conventional lock cable 50 having a first end 52 that is secured to the fixed structure 100 and a second end 54 that passes through the steel plate 12 thereby preventing removal of the flexible cable 18. A lock 56 is secured to the second end thereby locking all of the tanks to the fixed structure.

The scuba tanks consist of cylinders housing compressed air, argon, helium, nitrogen or a mix of thereof. Scuba tanks are available in several standard sizes, the larger of which is

1 an 120 cubic foot capacity tank, 7 and 1/4 inches in diameter, and approximately 26 inches high.
2 The most common tank is 80 cubic foot having slightly smaller dimensions. At the upper end
3 of a scuba tank there is a valve commonly called a K-valve 30. The K-valve include a rotatable
4 knob 32 for controlling the release of gas from the tank. The K-valve is subsequently coupled
5 to a hose and air regular that allows the diver to breath underwater is common between the
6 various size tanks. Thus, by providing a lock plate common to the K-valve, tanks of various
7 sizes can all be locked with the same device.

8 Figure 2 illustrates one embodiment of the locking device 10 which is formed from a
9 substantially square or rectangular steel plate 12 having an aperture 14 and a slot 16 depending
10 therefrom. The aperture 14 is sized to receive a flexible steel cable lock 50 . The locking
11 device 10 further includes a flexible attachment cable 18 having one end 20 permanently
12 attached to the steel plate 12 and a distal end 22 having an end fitting 24 swaged thereto. In this
13 embodiment the end fitting 24 is sized for insertion through the aperture 14. The flexible cable
14 18 is sized for placement within the slot 16 of the steel plate 12 and employs at least one cable
15 crimp 25 which operates as a line positioner. However, multiple cable crimps 25 can be used
16 to provide locking of the line at any number of positions and, when at least two cable crimps
17 25 are use, as shown, the cable can be fixed in length to prevent lengthening as well as
18 shortening of the flexible attachment cable once placed in the slot. It should be noted that the
19 proximal end 20 may be unattached wherein the flexible attachment cable 18 may be stored
20 independently from the steel plate lock and when use is required, engage the proximal end 20
21 with the slot 16. In addition, it is possible to use this embodiment wherein the lock can be used
22 independently from the main locking cable 50. The use of the smaller lug 24 can be passed

1 through an object that might not be secured by a standard loop as described later in this patent.
2 This would allow the cable to be used to lock wherein the steel plate lock can be secured by
3 placement of a regular paddle lock through aperture 14. The loop can secure various items in
4 the dive industry such as the regulator and groups of other equipment too small for a
5 conventional type loop system. However, the preferred mode is to permanently attach the
6 proximal end 20 of the flexible attachment cable to prevent loss of the component parts and
7 make it convenient for installation.

8 Now referring to Figures 3-5, the preferred embodiment of the locking device 10 is
9 depicted. The locking device is formed from a substantially square or rectangular steel plate 12
10 having an aperture 14 and a slot 16 depending therefrom. The aperture 14 is sized to receive
11 a flexible steel cable lock 50. The locking device 10 further includes a flexible attachment
12 cable 18 having one end 20 permanently attached to the steel plate 12 and a distal end 22 having
13 an end fitting 24 swaged thereto. End 20 can be either welded to the plate or employ a swage
14 fitting 21 which would prevent the end 20 from pulling through the plate. In this embodiment
15 the end fitting 24' is permanently inserted through the aperture 14 and is enlarged to operate as
16 a handle. The flexible cable 18 is sized for placement within the slot 16 of the steel plate 12 and
17 employs the crimps 25 to operate as a line positioner. Preferably the slot 16 is L-shaped
18 making it easier to maintain the flexible cable 18 in position while the cable lock 50 is placed
19 through the aperture 14.

20 In operation, the flexible attachment cable 18 is wrapped around the K-valve 30 and gas
21 handle 32 of a scuba tank. At least one crimp 25 is drawn through the aperture 14 and then the
22 cable 18 is transversed into the slot 16, leaving the aperture 14 available for the cable lock 50.

1 The flexible cable 18 is unable to reenter the aperture 14 due to the cable lock 50. The cable
2 lock 50 is passed through the aperture of one or multiple lock plates 12 in a consecutive order
3 until one or all the tanks are locked. If no fixed object is available, the locking of a plurality of
4 tanks, (i.e. four or more) would prevent theft of the tanks since multiple tanks could be most
5 difficult for a theft to lift or conceal. As this device can be used to lock an entire chain of tanks,
6 such as those found on a dive boat, it is simple to lock the tanks to together to deter theft.

7 It is to be understood that while I have illustrated and described certain forms of my
8 invention, it is not to be limited to the specific forms or arrangement of parts herein described
9 and shown. It will be apparent to those skilled in the art that various changes may be made
10 without departing from the scope of the invention and the invention is not to be considered
11 limited to what is shown in the drawings and described in the specification.

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